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1. Introduction

The development and construction of an irrigation system, its engineering marvel and hydrologic matters, agro-climatic and economic aspects are important. Equally important, but remains largely neglected, is the aspect pertaining to the characteristics of water users and their interaction with water (Chambers,1977; Vaidyanathan, 1985; Coward, 1980a). The technology of water use for agriculture developed over a period of several centuries and its history might as well go along with the pattern of human settlements and village societies (Steward, 1955).

Therefore the success or failure of an irrigation system depends to a great extent on the active participation of an individual beneficiary in association with community at large. The scope of this paper is unambiguously limited: It tries to examine the human relations with irrigation water in the specific context of a traditional community maintained irrigation system, namely tanks.

It is needless to emphasise the significance of tank irrigation system, as this source is one of the most important

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sources of irrigation from time immemorial in several parts of India and in particular, Tamil nadu state. It is quite impressive to note that there were reported to be about 39000 tanks in Tamilnadu as per the original records. However, the official statistics on the area irrigated by tanks shows that there has been a steady decline over a period of time. The decline is in fact very sharp in the districts like North Arcot, South Arcot and Chengalpattu districts, where more than one-half of the net irrigated was under tanks during early 1950s (Janakarajan,1986).

The deterioration of tank irrigation system has been the subject of considerable discussion atleast since the middle of 19th century. The Report of the Public Works commission of 1852 stated that there was not much of voluntary community labour involved in tank maintenance and it reported that in all districts labour was more or less forced (Saradaraju, 1942). In fact an Act was passed, namely, Madras Compulsory Labour Act (1858) or what was known as Kudimaramath[1] Act with a view to legalise compulsory labour for certain maintenance and also to penalise for non-performance of kudimaramath labour. The Act stated:

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1. The word Kudimaramath refers to the maintenance or repair work undertaken by the community. It was supposed to be a collective action of a community expending labour voluntarily in the repair or maintenance work of tanks.

"Whenever by local custom any work for the purpose of irrigation or drainage or connected herewith, is usually executed by the joint labour of a village community, any person bound by such custom to contribute labour to such work, who neglects or refuses without reasonable cause to comply with a requisition for such customary aid made to him by the head of the village under the orders of the Tahsildar or other superior Revenue Officer, shall be liable to pay a sum equal or twice the value of the labour which he is bound to contribute"[2].

The entire administration of the Act of levying and collection of fines were left to the irrigation panchayats. However, this Act was not comprehensive enough to bring about any radical changes in the _kudimaramath_ system. Moreover, the very essence of principles of _kudimaramath_ system, viz., the involvement of voluntary labour of water users in the maintenance work is lost in the Act and it only asserted the forced labour of the community. Therefore, fresh legi lations were recommended by the Famine Commission of 1878 and the Irrigation Commission of 1901-1903 (Baliga, 1960).

Famine Commission in particular brought to light quite forcefully the deteriorating conditions of tanks and advocted a systematic policy of maintenance. One of the most important recommendations of the commission was the creation of Tank

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2. The Madras code 4th Edition, Volume I, Pages 90-91. This passage was quoted in Baliga (1960).

Restoration Parties. As a result, Tank Restoration Scheme was commenced in 1883 first in Madurai district and then was extended to other parts. As a part of the scheme, detailed surveys were made and detailed memoirs were prepared to each one of the tanks. The Tank Restoration Party or Scheme also prepared detailed financial estimates to carry out maintenance work.

The Irrigation Commission strongly recommended the scheme proposed by the Tank Restoration Parties and repairs suggested by them were executed by the PWD in most cases. In addition, the Commission recommended that if Kudimaramath system could not be enforced without the aid of legislation then it suggested an alternative: That is to impose an irrigation cess on the land irrigated by tanks. The Commission recommended that the administration of the cess be left completely to irrigation panchayats. Subsequently, through a series of Irrigation Bills of 1901, 1922, 1924, 1928 and 1934-36, it was attempted but they only proved to be a futile exercise (Baliga, 1960; Sarada Raju, 1941; Krishnaswami, 1947).

The entire discussion on the tank maintenance or Kudimaramath and the need for legislative measures gained a great deal of significance mainly due to the deteriorating conditions of tanks and their associated structure. It was very much

reflected in the neglected conditions of the supply channel and heavy silt accumulation in the tank bed[3].

One of the main reasons attributed for the neglected condition of the supply channel was the extensive cultivation in the catchment area where, one found originally only jungles and hard soil. With the result of deforestation and encroachment of catchment area for cultivation, rain water falling in the catchment area never reached the tanks (Krishnaswami, 1947). The silt accumulation in the tank beds was again a serious subject of discussion for a long period time. As early as 1878, the Famine Commission made several remarks on the seriousness of the problem. Krishnaswami rightly points out the fact, "if the Commission of 1878 noticed that the beds of tanks were getting silted up, then it was not necessary to emphasise that since then there must have been silting up at an alarming rate"[4]. Col.Ellis emphasises the fact that no effective remedy has been discovered to overcome this chronic problem[5].

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3. S.Y.Krishnaswami, a well known bureaucrat, stated: "There is a general consensus of opinion among officers who have dealt with the maintenance of minor irrigation works and among the intelligent lay public that there has been systematic deterioration showing itself in the neglected conditions of the supply channels and unremitting silting up of the bed level of the tanks and in a general insufficiency of the water for the ayacut determined by the Tank Restoration Scheme Party and registered as such for each tank" See. Krishnaswami (1947)P.438.

4. See Krishnaswami (1947) P.443

5. "Many of the tanks have been impounding silt for centuries and have lost very considerable proportions of their original capacities to the great injury of the crops under them. No effective remedy for this has been discovered and the problem is one in which becomes increasingly serious as time goes on". See.Col.Ellis (1955).

Therefore, it is not as though the deterioration of tank irrigation system is a new phenomenon and that it attracts considerable attention of the present day government only. The government today is only trying to pursue the same old discussion but to what effect is not really clear. What is more important, however, is to go into the examination of main factors that have contributed for the deterioration of tank irrigation system before making any systematic attempts on restoring them by legal or any other means such as increased government expenditure.

The decline of tank irrigation system could be for several reasons: Heavy silt accumulation in tank bed and in inlet channel; frequent occurrance of droughts and inadequate and irregular supply to tanks; encroachments in the catchment area, inlet channel and tank bed; poor and damaged conditions of regulatory structures such as sluices, and surplus weirs; erosion of tank bunds; inadequacy of funds for maintenance work and so on. All these are only a set of physical factors which might have contributed for deterioration of the system.

There is also another set of important factors which could be broadly called "institutional" and which have direct bearing on the functioning of tank irrigation system. Some of the important institutional factors are changes in the land ownership pattern in terms of caste and class; changes in the mode of cultivation; development of productive forces and in particular, the development of ground water irrigation, disintegration of traditional village level institutions and so on.

While discussion at a great length takes place on the physical and technical factors, the discussion on institutional factors are either sektchy or nil. This subject gains significance mainly because, these technical and institutional factors do not act in isolation; they are complex and often interact. In this context, this paper makes a modest attempt to examine the characteristics and functioning of traditional irrigation institutions as it exists today and to probe into the factors underlying the disintegration of such institutions.

The paper is organised in the following fashion:

Section-2 following the introduction discusses the data source used and provides a broad outline of the Palar Anicut System; Section-3 clarifies the concept of traditional irrigation institution and its structure; Section-4 is devoted to highlight the varying degrees of functioning of irrigation institutions in the selected tank irrigated areas; Section-5 enters into the discussion of factors underlying varying degrees of functioning of irrigation institutions; and in the final section an attempt has been made to discuss the complex interaction of physical and institutional factors.

This note is based upon a field survey carried out in the selected tank irrigated areas fed by an age old system called Palar Anicut system (PAS)[6]. This system supplies water to 317

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6. This is a part of the large survey carried out by Prof.A.Vaidyanathan and the present author. The study was on "Management of Irrigation and Its Effect on Productivity under Different Environmental and Technical Conditions". The Project was funded by the Union Planning Commission, Government of India.

tanks irrigating an ayacut of about 80000 acres in North Arcot and parts of Chengalpattu districts of Tamil Nadu State through four major channels. Some tanks get supplies directly from the main/branch channels but a large number of them get supplies from the surplus flows of upstream tanks. The supply of water from the Anicut is irregular, inadequate and highly variable. For instance, the average volume of water drawn per annum through four major channels during the period 1964-1980 has been estimated at 4250 mt.ft., which is about 46% of the total storage capacity of all the tanks supposed to be receiving supplies from the Anicut. As a matter of fact, even this much of supply drawn from the Anicut cannot reach the tanks for, if allowances are made for seepage and evaporation losses, only a smaller quantum of water would reach tanks. Moreover, the supply from the Anicut is governed by no fixed schedules; it varies a great deal depending on the date of opening the channels, duration of supply, quantum supplied etc.

For our detailed survey, 15 tanks have been selected somewhat purposively to cover various reaches across main/branch channels as well as to capture various characteristics of tanks such as size, sources of supply, number of villages fed and so on. The field survey was carried out at different phases during 1986-87[7].

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7. For further details see Vaidyanathan and Janakarajan (1989).

2. The Concept of Traditional Irrigation Institutions (Tii) and Organisational Structure

The tii are characterised by several social arrangements and responsibilities basically with a view to serve the members of a village society. The social responsibilities of tii are to evolve and to adopt a common code for maintenance, for water sharing and for resolving conflicts. Therefore, the tii may be defined as the evolution of principles for collective action of users, for a broad spectrum of social responsibilities such as system maintenance, water sharing and conflict resolution [8].

However, the functioning of tii is basically a reflection of fundamental socio-economic structure of a village society. The most crucial aspect that has direct bearing on the functioning of tii is the nature of control over productive resources like land' and also water' in the present context. There are also several other physical factors such as size and location of tanks, sources of supply to tanks, availability of free catchment area and so on which have a bearing on the functioning. Most of these physical factors do not work in isolation and there exists a complex interaction among them [9].

Before examing the factors underlying varying degrees of functioning of tii, it will be useful to discuss its major functions. Originally, as we have discussed in the introductory

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8. For a detailed discussion on traditional irrigation systems and their obligations see Coward (1980)b; Vaidyanathan, (1985).

9. See also Vaidyanathan, (1985).

section, the tii controlled practically all activities relating to tanks. For instance, the tii assumed responsibilities for the maintenance of supply channel (or inlet channel), for desilting tank bed and to strengthen the tank bunds, to maintain the regulatory structures such as sluices and surplus arrangements, maintenance of channels in the command area of a tank, regulating water supply, resolving disputes that arise in the process and so on. However, over the years some of the key functions such as the maintenance of supply channel and desilting of tank beds were neglected by the traditional village systems. Thus, at present, in most of the tanks water users take only limited responsibilities that too not regularly.

The organisational structure in a village society, for carrying out the responsibilities of a t.i.i., operates at two levels: One is at a more supervisory level as an enforcing authority and the other at a menial level involving hard labour. The first type is called Nattamaikar' (a group of persons, almost representing the entire village) or Kavaimaniyam' (generally one person). While the latter is a more specific irrigation functionary, concerned with organising maintenance work etc., the former, besides carrying out the tasks of t.i.i., also have to organise village/temple festivals and so on. Wherever, Kavaimaniyam exists, the Nattamaikar also exists but where Nattamaikar assume responsibilities of a t.i.i. Kavaimaniyam does not exist. In general, the Nattamaikar and Kavaimaniyam are from upper castes who are also very often well to do farmers. Both these are honorary appointments except in one

tank where the Kavaimaniyam is appointed and paid by the PWD (Kaliyur Tank). The posts of Kavaimaniyam and Nattamai used to be hereditary upto some three or four decades ago, but at present in most of the villages the selection has ceased to be on hereditary basis. One can attribute several reasons for the breakdown of selection of village head men on hereditary basis, but the most important reason is the extensive transfer of land from upper caste to lower caste people or the transfer of power from upper castes to lower castes.

The body of Nattamai or Kavaimaniyam is assisted by a group of irrigation workers called Neerkattis who are selected generally from among harijan households in rotation. The major responsibilities of neerkatis are to inspect the inlet channels during monsoon months when water flows and to bring to the notice of the Nattamaikar or Kavaimaniyam about any breaches or illegal tapping of water by upstream farmers, to watch the bunds and surplus weirs particularly during flood situation, to irrigate lands as per the directions of Kavaimaniyam or Nattamai and to protect the crop from cattle. The number of neerkattis vary from 1 to 10, depending upon the size of ayacut. The neerkattis are paid in kind every season (only when tank water is used, full payments are made as per the convention; otherwise they are paid far less than the usual payments) by farmers of a concerned ayacut. Generally, wages are not paid per person. If the tank water is used, the payments range from 5kgs of paddy per acre to 15 kgs per acre per season (see Table-2). Whatever quantity is paid on the basis of ayacut area cultivated, will be pooled

together and shared equally among the irrigation workers. In some villages, neerkattis are assisted by a category of workers called thottis whose responsibilities are to deweed the main/branch distributaries, to protect crops from cattle etc. But they get slightly lesser wage than neerkattis. In our survey of 15 tanks, in two of them (viz., Paranthur and Kaveripakkam) thottis were existing as a category of irrigation workers. Generally the payments to irrigation workers were paid in paddy stalk.

The most common method of functioning of Nattamai or Kavaimaniyam is to call for a meeting of ayacutdars as soon as a tank starts receiving supply through its feeder channel by having neerkattis announced the meeting by beat of drum. In the meeting it will be decided when to start the maintenance work and contribution of labour by each ayacutdar. Usually one person per acre or in some cases one person per kani (1 kani = 1.32 acres) will be the requirement. If a particular ayacutdar fails to contribute his labour then he should substitute with a hired labourer. If a farmer fails to do both then he will be fined. In fact, some tanks (e.g. Pudupakkam tank, Kaliyur tank) the Kavaimaniyam maintains pucca records on the extent of labour involved in maintenance work. Extent of labour involved very much depends upon the extent of maintenance work needed in any given year.

The method of functioning of a t.i.i. and the organisational structure is some what different in the case of a large tank. This is found in a multi-village tank selected for the survey

(Kaveripakkam tank). The Kaveripakkam tank has the storage capacity of 1474 mcft. with a registered ayacut of 6278 acres providing irrigation to 14 villages. This tank is at the head of Kaveripakkam main channel, the surplus from which irrigates an extent of about 10500 acres. The surplus channel of this tank (the bed width of which is 86 feet) is occasionally desilted and deweeded by the PWD. Farmers never indulged in the collective effort for maintaining it for, it involves a co-oridnated effort of users of several villages which is not possible.

For the management and regulation of tank water in this tank there is a body called Irrigation Board established in 1924. The Board is constituted by an elected president, secretary and delegates representing various villages/sluices. The election is conducted in an organised way by either a Revenue Divisional Officer or a Thasildar. Those who pay the wet assessment of Rs.5/- and more are eligible to vote. First the delegate for all the 10 sluices representing 14 villages will be elected, who in turn, elect the office bearers of the Board, viz., President and Secretary. Although the elections should be held once in 5 years, no elections were held after 1969. At present, the same President, Secretary and delegates continue to serve the Board (except three delegates who passed away during this period). The Board is assisted by four <u>neerkattis</u> appointed and paid by the Government. The responsibilities of these neerkattis are to inspect the inlet channel, sluices, surplus weirs and bunds of the tank, to prevent illegal tapping from inlet channel and through the slucies, to prevent encroachment in the tank bed etc.

Till 1980, they were selected on hereditary basis from among harijan households but after that it became open for everybody. At present, of the 4 neerkattis, three belong to the scheduled caste and one belongs to Vanniar caste and their monthly remuneration is about Rs.400/-. Normally the sluices are opened and closed only by PWD laskars (after taking the advise from JE), but JE concerned can open or close the sluices only on the recommendation of the Board.

While the powers of the Irrigation Board rests only upto the sluices, the body of Nattamai, which we discussed earlier, takes care of the maintenance of main distributaries and field channels and water regulation below the sluices. Thus, in the bigger and multi village tanks the institutions function in a much more oranised manner than in smaller and single village tanks[10].

3. Varying Degrees of Functioning of Tii

Functioning of t.i.i. in the selected tanks can be seen from Table-1. The table shows that the t.i.i. functions at a varying degrees in the selected tanks; in some it is effective; in some others it is less effective; while in the rest it is defunct. Out of 15 tanks, the institutions are effective in 7 tanks, it is less effective in 2, and in 6 it is defunct. In the seven tanks where the t.i.i. is effective, one can notice that the maintenance work of inlet channel, main distributaries and field

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10. There is another such big tank called Dusi-Mamandur tank which we selected for the preliminary survey. The ayacut of this tank is about 4200 acres spread over 18 villages. Like that of Kaveripakkam tank Irrigation Board exists in this tank also and functions in an organised manner.

channels is done somewhat periodically in the past 5 years. Also there exists a well established system of water allocation called murai but appears to be at present a mere technique of (scarcity) crisis management. Moreover, in 5 out of 7 tanks, where t.i.i. are effective, there exists specific irrigation functionary viz., Kavaimaniyam. In the case of two tanks where it is less effective the maintenance work is not done regularly atleast in the past five years. Moreover, in both these villages, no system of water allocation (Murai) was followed in the past five years. In the case of six other tanks, the t.i.i. is defunct and in all of them there was absolutely no maintenance work done in the past 5 years. Infact, in 4 of them for more than 15 years no maintenance work was reported to be undertaken. In these villages there is absolutely no system (Murai) of water allocations. AlthoughNattamai exists in these villages, this body only takes care of temple and village festivals. Quite surprisingly in 14 out of 15 tanks, the irrigation workers exist and receive conventional payments. However, the payments made to them vary across villages according to the degree of functioning of tii. The payments are far better in the tanks where tii is effective than those where it is defunct (See Table-2). In those tanks where tii is defunct, the neerkattis are more involved in the village and temple festivals, beating drums during funerals though in some tanks they also perform some agricultural operations such as manuring, deweeding the field channels, bunding etc. for which they get some additional payments. In one case (Vembi Tank), even neerkattis do not

Table 1: Varying Degrees of Functioning of Tii.

Tank/ Channel	functioning of t.i.i.: maintenance of (in the past 5 years): inlet channel	main distributaries	field channel	Prevalance of *Murai*	Existence of Irrigation functionaries: Kavai maniyam	Nattamai	Neerkatti	Degree of effectiveness of t.i.i.
1 Kaveripakkam	X	√	√	X	X	/	/	Less effective
2 Peruvalayam	√	√	√	√	X	/	/	Effective
3 Agavalam	√	√	√	√	/	/	/	Effective
4 Thakkolam	X	X	X	X	X	/	/	Defunct
5 Karivedu	√	√	√	√	X	/	/	Effective
6 Perumbulipakkam	X	X	X	X	X	/	/	Defunct
7 Poigainallur	X	X	X	X	X	/	/	Defunct
8 Thiruppukuzhi	X	X	X	X	X	X	/	Defunct
9 Pudupakkam	√	√	√	√	/	/	/	Effective
10 Paranthur	√	√	√	√	/	/	/	Effective
11 Neervalur	√	√	√	X	X	/	/	Less effective
12 Velur	√	√	√	/	/	/	/	Effective
13 Vembi	X	X	X	X	X	/	X	Defunct
14 Sirungattur	X	X	X	X	X	/	/	Defunct
15 Kaliyur	√	√	√	/	/	/	/	Effective

√ refers to maintenance work done regularly in the past 5 years and the existence of irrigation functionaries

X refers to non-existence of maintenance work and irrigation functionaries.

Source: Survey

exist, and farmers use the tank as merely a percolation pond. It was reported in this village that since farmers do not make payments, the neerkattis refused to work for the past five years.

On the whole, the ayaçutdars keep up the convention of maintaining neerkattis (although most other institutional arrangements are defunct) mainly for purposes other than tank maintenance such as village/temple festivals and other menial work.

Nevertheless, in almost all the tanks we surveyed it was reported that the t.i.i. were in operation before 3 or 4 decades and were also reported to be effective. It is this context which warrants probing into the factors underlying this varying degrees of functioning of t.i.i.

Table: 2 Number of Neerkattis and payments made per person (in Kgs. of Paddy)

1 marakkal = 5 Kgs.

(Paddy)

No.	Tanks	No. of neer-kattis	Regd. ayacut (acres)	Payments per season per acre (in marakkals)	Pay ments per season for the ayacut (in Kg)	Payment per person in Kgs.
	Tanks where t.i.i. is effective					
1	Peruvalayam	2	248	1.0 marakkal	1240	620
2	Agavalam	2	445	3.0 marakkals	6675	3338
3	Karivedu	1	370	2.0 marakkals	3700	3700
4	Pudupakkam	5	836	3.0 marakkals	12540	2508
5	Paranthur	6+4	779	2.5 marakkals	9738	1623
6	Velur	3	578	2.0 marakkals	5780	1927
7	Kaliyur	6	530	3.0 marakkals	7950	1325
	Tanks where t.i.i. is less effective					
1	Kaveripakkam	5+5	NA	NA	NA	NA
2	Neervalur	7	735	1.5 marakkals	5963	852
	Tanks where t.i.i. is defunct					
1	Thakkolam	2	518	1.0 marakkal	2590	1295
2	Perumbulipakkam	2	129	2.0 marakkals	1290	645
3	Poigainallur	1	162	2.0 marakkals	1620	1620
4	Thiruppukuzhi	2	476	2.0 marakkals	4760	2380
5	Vembi	Nil	14[illegible]	Nil	Nil	Nil
6	Sirungattur	1	137	2.0 marakkals	1370	1370

Note: Data presented in this table is based upon the interviews held with the irrigation workers and this may not give an accurate picture.

Source: Survey

4. Factors Underlying Varying Degrees of Functioning of Tii

4.1 Control Over Productive Resources

(A) Water: One of the most significant factors that has affected the functioning of the t.i.i. is the emergence of wells in the tank ayacut. The spread of well irrigation in these districts (Chengalpattu and North Arcot) has been tremendous after the large scale rural electrification (during late 50s) and this process perhaps, intensified after the introduction of new technological package in agriculture, which required more assured and controllable source of irrigation. In fact, in the past couple of decades, well has become an important source of irrigation even in wet lands irrigated by tanks and spring channels. The underlying point is that hitherto the irrigation water was treated as a property of a village society, to which every individual user had responsibility for maintenance; but after the emergence of well in the ayacut, the irrigation water has become private property- the private property for those who have access to resources to invest in wells and in water extracting mechanism. Thus, along with land, water also has become an important productive resource. Hence these farmers who have access to ground water (which is private, more assured and controllable) lost interest in the tank water and its maintenance and so the collective effort in the maintenance work and in the system of water regulation (murai) got weakened.

Infact the interviews we had with neerkattis (irrigation workers) turn out to be the best evidence to substantiate this point. It was reported that the neerkattis hardly receive full

payments at present in contrast to the fact that their forefathers were receiving substantially higher payments. They unambiguously point out the fact that the villain of the game has been the spread of well irrigation in the wet lands also (tank commands).

Same point could be substatntiated with some statistical details (see Table-3). Table-3 gives information on the well density in the ayacut and percentage of all plots getting well irrigation (in 1985-86) as per our sample survey. We will notice that in all the six tanks where the t.i.i. is defunct (See Table-1) viz., in Thakkolam, Perumbulipakkam, Poigainallur, Tiruppukhuzhi, Vembi and Sirugattur, the well density is very high (i.e. well per acre) i.e. 0.18, 0.25, 0.16, 0.07, 0.28 and 0.33 respectively. In Tiruppukhuzhi, although one finds only 0.07 well per acre, the percentage of area receiving well irrigation is found to be 67.4%. For other tanks also it is considerably high and in three of them it is over 80%. In fact the case of Vembi is the most interesting one, where the sluices have been kept closed for the past 7 years and the tank solely serves the purpose of a percolation pond. (This is the only village where even neerkattis have stopped working since 1980). On the contrary, while looking at the tanks where the t.i.i. is effective, the well density is found to be low and also percentage of area receiving well irrigation is insignificant. For instance, in four out of seven tanks where the t.i.i. is effective, the well density is found to be low and also percentage of area receiving well irrigation is insignificant.

Table:3 Well Density and % of area receiving well irrigation in the ayacut

Sl. No.	Tanks	Well per acre	% of area receiving well irrigation in the ayacut
	Tanks where t.i.i. are effective		
1	Peruvalayam	0.04	NA
2	Agavalam	0.14	NA
3	Karivedu	0.01	18.7
4	Pudupakkam	0.02	30.8
5	Paranthur	0.01	2.8
6	Velur	0.20	70.8
7	Kaliyur	0.21	27.5
	Tanks where t.i.i. are less effective		
1	Kaveripakkam	0.13 *	NA
2	Neervalur	Nil	Nil
	Tanks where t.i.i. are defunct		
1	Thakkolam	0.18	97.2
2	Perumbulipakkam	0.25	72.2
3	Poigainallur	0.16	41.3
4	Tiruppukuzhi	0.07	67.4
5	Vembi	0.28	89.9
6	Sirungattur	0.33	83.8

*Worked out for the entire Kaveripakkam tank ayacut.

Source: Survey

For instance in the four out of seven tanks where the t.i.i. is effective, viz., Peruvalayam, Karivedu, Pudupakkam and Paranthur, the well per acre works out to 0.04, 0.01, 0.02 and 0.01 and even the percentage of area receiving well irrigation works out to be very low. Only in three tanks (Velur, Agavalam and Kaliyur) where the t.i.i. is effective but at the same time well per acre is also high (0.20, 0.14, and 0.21 respectively). This is probably due to physical factors such as that of an assured supply to the tank (Kaliyur) from other systems and the locations of a tank in the head reach of a supply channel (like Velur is the head reach tank of Kalavai channel). It may be interesting to note here that in all tanks where the t.i.i. is defunct and where the density of wells is very high, the supply from inlet channel is also stopped.

The fascinating point is that before the emergence of sub-surface irrigation in the tank commands, the plots of land which were favrouably located in terms of access to tank water for more than one crop (generally the head reach plots or the plots which are closer to sluices or the plot of land which receive water from the deepest sluice) were valued high. However, after the spread of well irrigation this notion remains no longer true, for it is the plot of land which has got good ground water potential that commands better price and not the one which has locational advantage in terms of closeness to sluices.

(B) Control Over land and Land Transfers:

The land transfers (from upper castes to lower castes have been taking place to a great extent in all the selected tank

ayacuts with a few exception, and this has resulted in the breakdown of old power relations. In most of the selected tank ayacuts, before 4 or 5 decades, it was reported that a greater proportion of wet land was held by Brahmins and other high caste Hindus like Mudaliars, Chettiyars, Naidus etc. But at present Naickers have emerged as one of the major land owners in the tank ayacut and in several places, Harijans also have acquired land to a significant extent. Due to changes in the caste-class relations, the t.i.i. which were hitherto managed effectively by the old landlords, broke down.

As a result of the land transfers, lot of caste factions have emerged which really stand in the way of effective functioning of t.i.i.[11]. In the case of Kaveripakkam tank for instance, in the head reach village of the deepest sluice, (Kaveripakkam) Naickers have acquired lot of lands from Brahmins, Chettiyars and Mudaliyars and in the tail end village of this slucie (Eralacheri) Harijans and Pillai have bought land. Even when there is 5 months water supply in the tank, it was reported that Naickers of Kaveripakkam never let water to flow to the tail end village and this has resulted in several disputes. Within the head reach village also (Kaveripakkam) there are conflicting interests between Mudaliars and Naickers. This is very much reflected in the emergence of separate <u>Nattamai</u> for Naickers in the past 2 decades; till then only Mudaliar <u>nattamai</u> was taking

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11. See also Narayana et al (1982) and Rajagopal (undated).

all the decisions concerning the village. Such land transfers and caste factions are also seen in many other tanks such as Thakkolam, Perumbulipakkam, Poigainallur, Tiruppukkuzhi, Sirungattur, Velur and Neervalur. Of these, in the first five tanks tii is defunct. In other words, the land transfers resulting in changes in the mode of cultivation and the emergence of caste factions within an ayacut do not provide a conducive atmosphere for any collective effort.

The problem of sub-division and fragmentation has been another serious problem which is the direct off-shoot of land transfers. In most of the villages sub-division and fragmentation has been taking place at a rapid rate which comes in the way of effective functioning of tii. When there were relatively small number of land owners belonging to one or two castes, agreement on management of tank related activities was easier or collective action was possible. But the situation appears to have got highly complicated after a large scale transfer of lands to several castes and series of sub-division and fragmentation increased tremendously number of holdings. This really poses a severe threat for the effective functioning of tii. For instance, in Dusi-Mamandur tank (the ayacut of which is 4118 acres, irrigating 18 villages) number of sub-divisions at the time of first settlement (1882) were 8638. During the second settlement (1913) it rose to 11829 and in 1982, the number went upto 14378. In other words, average extent per sub-division declined from 0.48 acre in 1882 to 0.29 acre in 1983. Similarly in Kaveripakkam Tank (the ayacut of which is 6200 acres,

irrigating 14 villages), the number of sub-divisions at the time of first settlement (1882) were 6085, which rose to 8589 during second settlement period (1913). The number went upto 12266 in 1983. In other words, the average extent per sub-division declined from 1.05 acres in 1882 to 0.48 acre in 1983.

The situation is more complicted when water rights are also sold along with land. The complication arises when a plot of land is sub-divided, in the determination how to distribute or transfer the water rights to respective sub-divisions. In fact, in one of the villages surveyed (Perumbulipakkam) when land transfers took place from Brahmins to other castes, the <u>karnam</u> (village level revenue officer) who generally drafted the sale documents, was bribed by several farmers for transferring extra water rights (more than what one was entitled to) along with the land they bought. This by itself did not in any case assure water right. But once it was stated in the document, at some subsequent stage, the person might claim more water. There were reported to be many such instances in this village which resulted in intra-ayacut disputes in the past.

Yet another impact of land transfers is the emergence of absentee owners in the tank ayacut which also affects the effective functioning of t.i.i. For instance in Poigainallur, about 50% of the ayacut land is held by absentees (living in a neighbouring village but doing own cultivation) and in Sirungattur, about 70% of the land is held by farmers of a neighbouring village. Since <u>Nattamai</u> or <u>kavaimaniyam</u> of one village cannot exercise control over farmers of other village,

collective effort relating to the tank ayacut becomes difficult, and unmanageable.

In other words, the set of conducive institutional factors that preserved the tii intact in the past were:

(i) There were not much of caste factions; land was controlled by one or two upper castes (who were invariably both economically and socially forward).

(ii) The mode of cultivation was primarily on the basis of tenancy contracts (mostly share cropping contracts); therefore, landlords were in a position to make use of their tenants for kudimaramath works at free of cost.

(iii) Tank was the only source of irrigation and well irrigation was unknown in the tank commands.

(iv) Level of development of technology was low; only traditional varieties were grown and hyv technology and other related input package was unknown.

(v) There were not much of sub-division and fragmentation.

(vi) Absentee ownership was almost unknown or not reported to be a major problem.

So much to highlight the major institutional factors that might have contributed for the varying degrees of functioning of tii. In the next few pages I shall discuss the extent to which physical and technical factors contribute for the weakening of tii.

4.2 Physical Factors

(A) Location:- As per the conventional notion, the head reach tanks of each main/branch channels are always better placed in terms of availability of supply of water to the tank. This very much holds good as one can see from Table-1. The t.i.i. are effective in all the head reach tanks of main/branch channels (Peruvalayam, Karivedu, Pudupakkam and Velur). Again in the tail end tanks viz., Thakkolem (kaveripakkam surplus channel) and Thiruppukuzhi (Govindavadi Channel), the t.i.i. are defunct. In the case of Neervalur, which is the tail end tank of Kambakkal channel, the institutions although not defunct, remains less effective. The case of Kaliyur (tail end of Kalavai channel) is unique. The supply from (Palar Anicut) Kalavai channel stopped more than 20 years ago, but this tank receives almost regular supply from two other sources. Hence the t.i.i. are still effective, although located at the tail end of a channel.

(B) Sources of supply to a tank: Supply to a tank may be from two sources; one from PAS source and the other from non-PAS sources. Within the PAS source, it may be directly from the inlet channel; from the surpluses of upstream tanks or from both. The non-PAS sources are through spring channels or from other systems. The availability of water directly through an inlet channel is the most assured one; whereas the supply through the surpluses of upstream tanks is not assured to the same degree. For instance in most of the functioning tanks where the t.i.i. are effective or less effective, the supply is directly through the inlet channel (e.g. kaveripakkam, Peruvalayam, Agavalam,

karivedu, Pudupakkam and Velur). In most of the tanks where the t.i.i. are defunct, the supply is through the surpluses of upstream tanks. There are two cases where although the supply through the PAS sources is stopped completely for over a decade, the t.i.i. are effective basically because these ayacuts receive supply from non-PAS sources. F r instance, it is more than a decade since water flowed through the Gafoor sluice (which is the most elevated sluice of Kaveripakkam tank). But still the t.i.i. are effective beasically because this ayacut receives almost regular supply through a spring channel from Palar river. Again in the case of Kaliyur tank, the t.i.i. are effective even though water from PAS sources stopped more than 20 years ago. This is because, this tank receives supply from two other sources, viz., from Cheyyar spring channel and from Thandarai Anicut (constructed across Cheyyar river).

Apparently, in addition to the supply channel from Anicut sources, most of the tanks were getting supplies from spring channels. With a few exception, in most of the cases such springs had completely dried up at present. Preliminary survey was conducted in 27 tanks in Nort. Arcot district, of which only five tanks still receive supply from spring channels, that too for about 3 to 4 months during monsoon months. In all others it has stopped and in several cases the spring channel has been silted up and encroached upon. The more typical cases are reported in Puduppakkam, Perumbulipakkam, Thakkolam, Poigainallur, Tiruppukkuzhi, Vembi, Sirungattur and Karivedu where springs stopped supplying more than 20 years ago. Please

note also that in most of these tanks tii is defunct.

(c) __Siltation and Encroachment in the Supply Channel__

In majority of the tanks surveyed, the condition of the supply channels are in a miserable state: They are silted up, encroached upon or affected by heavy weed growth. With the result, the supply channels are narrowed down. Therefore, volume of water that could flow in the channel is considerably reduced. In fact in several of the cases these channels hardly bring any water from the anicut sources.

The supply channels are under the direct control of PWD authorities but apparently suffers from prolonged neglect. Out of 26 tanks studied for the preliminary survey, only in 12 tanks it was reported that PWD had undertaken some maintenance operations in the supply channel atleast once in the past six years preceding our survey. Nevertheless, whatever little work had been undertaken by the PWD was totally not satisfactory and it apparently had helped only the contractors who also had political contacts. The PWD authorities however assert that the availability of resources for maintenance work is grossly inadequate to carryout any satisfactory job. This may be partly true.

However, we found that in most of the tanks where the tii is effective, there has been some concerted efforts to augment the supply to their tankse through the supply channel. For instance, farmers of Puduppakkam jointly desilted the inlet channel in 1983-84 and 800 mandays were spent in 15 days. Farmers of Parandur, Neervalur and Karivedu villages report that they hardly

get supplies from the Anicut, but still they jointly desilt the inlet channel mainly with a view to tap the rain water from the catchment area. On the other hand, in all other villages where tii is either defunct or less effective, there has not been any concerted efforts of any kind to augment the supply to tanks.

(D) **Siltation and Encroachment in the Tank Beds**

Silt accumulation in the tank bed has been a serious subject of discussion for more than a century.

S.Y. Krishnaswami remarks:

> "There is not much doubt that in years gone by, the tanks must have been very much deeper than they are now and that they must have had greater capacity. If the Commission of 1878 (Famine Commission) noticed that the beds of tanks were getting silted up, then it is necessary to emphasise that since then there must have been silting up at an alarming rate...... If this proces goes on unchecked it is not impossible to visualize that within the next 30 or 40 years a great many of the existing tanks will cease to be in use and will therefore have to be abandoned"[12].

The author's vision has infact come true, as several of the tanks that were in use some 40 years ago are at present either not seen at all or abandoned, in particular smaller ones. As a result of silt accumulation in the tank bed, the original

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12. See Krishnaswami (1947), PP 443

storage capacity has been considerably reduced. Although there are no systematic estimates available on the extent of silt accumulation in the tank beds, our own survey apparently indicates that it is quite a common problem found in all the 26 tanks surveyed for the preliminary survey[13]. Farmers'impressionistic reports confirm the fact that the storage capacities of tanks have been reduced progressively over a period of time. Official estimates on silt accumulation is available in the case of one large tank, viz., Kaverippakkam, where the water level at the deepest sluice has been reduced from the original height of 31 feet to only 17 feet, and the effective storage capacity has been reduced from 1474 mc.ft. to 1162 mc.ft. (as estimated in 1931). The official estimates show that the rate of silt accumulation has been 0.2% per annum.

One of the main reasons for silt accumulation in the tank beds has been due to temporary encroachment of farmers for raising crops like vegetables. The growing of crops in the tank beds accentuates the problem of siltarion mainly because farmers after harvest never take pains to remove the plants. This has been a common practice reported to be happening in most of the tanks surveyed. Another type of encroachment, which is somewhat permanent in nature, is found in the foreshore area and the extent of encroachment varies from 3 acres to 50 acres in the tanks surveyed.

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13. See also MIDS (1983)

(E) Availability and the Conditions of Catchment Area

I have already indicated in the introduction the significance of preserving of catchment area. This again was the problem of serious discussion atleast for the past 4 or 5 decades (Krishnaswami, 1947). Apparently, as a result of demographic pressure the catchment areas have been converted into cultivable lands and as a consequence, the supply of water to the tanks through supply channels have been reduced. This has been reported as a more common problem in all the tanks we surveyed.

Nevertheless, the extent of availability of free catchment area assures supply to a tank. That is, if the free catchment area is large enough for a particular tank then the users will have some guarantee of tapping atleast the rain water by way of desilting and deweeding the inlet channel. On the other hand if the free catchment area is relatively small, then the users may not get any such incentive to enter into a collective effort. The data shows that (See Table-4) atleast in four of the seven tanks where the t.i.i. are effective, the free catchment area per acre of ayacut is large (i.e., in Peruvalayam, Paranthur, Velur, and Kaliyur) and in three of the six tanks where t.i.i. are defunct, it is seen to be relatively low (i.e. in Thakkolam, Poigainallur and Tiruppukuzhi).

On the whole, the entire discussion pertaining to the conditions of physical factors in acting upon the functioning of tii drive us to two points viz., flow of supplies and storage capacity of tanks: Supplies to the tanks are either reduced or

Table 4: Availability of Free Catchment Area

Sl. No.	Tanks	Free catchment area (sq.miles)	Free catchment area per acre of ayacut (sq.miles)
	Tanks where t.i.i. are effective		
1	Peruvalayam	1.20	0.0052
2	Agavalam	0.55	0.0012
3	Karivedu	0.50	0.0007
4	Pudupakkam	0.95	0.0014
5	Paranthur	3.92	0.0050
6	Velur	2.00	0.0035
7	Kaliyur	3.80	0.0072
	Tanks where t.i.i. are less effective		
8	Kaveripakkam*	12.00	0.0019
9	Neervalur	3.00	0.0038
	Tanks where t.i.i. are defunct		
10	Thakkolam	0.75	0.0014
11	Perumbulipakkam	0.75	0.0058
12	Poigainallur	0.15	0.0009
13	Tiruppukuzhi	0.16	0.0003
14	Vembi	0.75	0.0052
15	Sirungattur	0.57	0.0040

* Computed on the total ayacut of Kaveripakkam Tank (6278 Ac)

Source: Survey

completely stopped; and the storage capacity of tanks is considerably shrunk due to silt accumulation and encroachments in the tank beds. The fact of the matter is that all these deteriorating conditions of physical facilities reinforce the point that the traditional irrigation institutions are in the process of disintegration in most of the tanks.

5. Concluding Observation

It was indicated right at the beginning that the varying degrees of functioning of tii is attributable to a series of institutional and physical factors: The Institutional factors are the nature of control over productive resources, changes in the land ownership pattern in terms of caste and class, changes in the mode of production and the level of development of productive forces; and the physical factors are the location of a tank, sources of supply to a tank, siltation and encroachment in the supply channel and in the tank bed, availability and the conditions of catchment area and so on. It was also pointed out earlier that all these factors (both institutional and physical) do not act in isolation and that there exists a complex interaction among them. I shall elaborate on this point in the next couple of paragraphs.

Perhaps, I should start by taking up the issue of development of sub-surface irrigation in the tank commands. This development for instance, cannot be viewed as an isolated phenomenon- independent of other changes that have taken place in the villages: Land transfers from upper castes to the hitherto cultivating castes has been a fundamental change that has taken

place in the villages, which in turn has resulted in the emergence of owner cultivation in the place of teneancy contracts. The changes in the mode of cultivation, coupled with the introduction of new technology have induced farmers to go in for an extensive development of well irrigation in particular in wet lands[14]. As a consequence, private control and ownership of irrigation water (viz., ground water) farmers interest in the collective effort for maintaining a traditional irrigation systems gets weakened. In other words, all these changes, unambiguously reveal the fact that the traditional landlords who exercised a great deal of "power" in preseving and controlling the traditional village systems including that of traditional irrigation institutions, have lost their hold. Therefore, tii in its normal course got disintegrated or in the process of disintegration in most of the tanks surveyed. But this is just one part of the story.

The access to and control over ground water has also affected seriously the physical conditions such as supply from inlet channels, storage capacity of tanks etc. As a result of extensive exploitation of ground water (in particular, in the catchment areas) the inflow of water in the supply channels has been either reduced or stopped completely. Moreover, in most of the tanks we surveyed it was reported that the extensive

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14. See also for transformation that have taken place in rural North Arcot District, bandara, C.M. (1977); Chinnappa, B.Nanjamma (1977); Harriss,John (1982);Janakarajan (1986).

development of well irrigation inthe catchment areas has resulted in the reduction or drying up of supplies from spring channels (which were once regularly feeding the tanks). Infact, out of 26 tanks surveyed, in 23 of them supplies through spring channels are either insignificant or have stopped. Moreover, due to extensive development of well irrigation and over use of ground water (in the tank commands), the tanks' withholding capacity is reduced.

Therefore, it is apparent that the characteristics and varying degrees of functioning of tii is influenced by the complex interaction of institutional and physical factors. On the surface, the often suggested measure of revival of tii (or creating new institutions) appears to be an easy task, but the evidence provided in this paper unambiguously brings out the fact that the problem is not all that simple but is deeply rooted.

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